WE CLAIM:

1. A flow diverter comprising:

a heat sink array in fluid communication with a turbine outlet and an inlet face of a heat exchanger,

said heat sink array comprising a plurality of heat sink elements,

said heat sink array being separated from said inlet face by a distance,

said heat sink array being positioned between said turbine outlet and said inlet face such that at least a portion of a fluid flowing from said turbine outlet contacts said heat sink array before said portion of said fluid contacts said inlet face.

2. The flow diverter of claim 1, wherein at least one of said heat sink elements comprises:

a hollow member having an outer surface,

an inner surface separated from said outer surface by a wall thickness,

said inner surface being in fluid communication with a heat exchange medium having a temperature greater than the freezing point of water.

3. The flow diverter of claim 2, wherein said hollow member is arranged essentially perpendicular to said fluid flowing from said turbine outlet.

4. The flow diverter of claim 2, wherein said outer surface is characterized by a cross section comprising a plurality of sides.

5. The flow diverter of claim 2, wherein said hollow member is characterized by an essentially circular cross-section.

6. The flow diverter of claim 5, wherein an outer diameter of said hollow member is greater than or equal to about 4 times said wall thickness.

7. The flow diverter of claim 1, wherein said heat sink array comprises:

a plurality of hollow tubes,

each of said plurality of hollow tubes having an outer surface contactable with said fluid,

each of said plurality of hollow tubes having an outer surface separated from an inner surface by a wall thickness, and

each of said inner surfaces of said hollow tubes being in fluid communication with a heat exchange medium having a temperature greater than the freezing point of water.

8. The flow diverter of claim 7, wherein said plurality of hollow tubes are each arranged essentially perpendicular to said fluid flowing from said turbine outlet.

9. The flow diverter of claim 8, wherein said plurality of hollow tubes are each arranged essentially parallel to each other.

10. The fluid flow diverter of claim 9, wherein said plurality of hollow tubes are arranged in at least one plane disposed essentially perpendicular to said fluid flowing from said turbine outlet.

11. The fluid flow diverter of claim 10, wherein:

said plurality of hollow tubes are arranged in a plurality of parallel planes, and

each of said parallel planes is disposed essentially perpendicular to said fluid flowing from said turbine outlet.

12. The fluid flow diverter of claim 11, wherein said plurality of hollow tubes are arranged in a staggered configuration.

13. The fluid flow diverter of claim 1, wherein a first distance between said turbine outlet and an outer surface of said heat sink element is about 1% of a second distance between said turbine outlet and said heat exchanger inlet face.

14. The fluid flow diverter of claim 13, wherein said first distance is about 99% of said second distance.

15. The fluid flow diverter of claim 1, wherein at least one of said heat sink elements comprises an electric heater.

16. The fluid flow diverter of claim 1, wherein a first velocity of said fluid prior to said heat sink array is greater than or equal to about 5 times a second velocity of said fluid in contact with said heat exchanger inlet face.

17. The fluid flow diverter of claim 1, wherein said fluid, prior to said heat sink array, has a velocity greater than or equal to about 250 ft/sec, and a temperature less than or equal to about 32°F.

18. The fluid flow diverter of claim 17, wherein said fluid, in contact with said heat exchanger inlet face, has a velocity of less than or equal to about 50 ft/sec.

19. A flow diverter comprising:

a heat sink array in fluid communication with a turbine outlet and an inlet face of a heat exchanger,

said inlet face being in fluid communication with an outlet face of said heat exchanger,

said heat sink array comprising a plurality of hollow tubes having an outer surface separated from an inner surface by a wall thickness;

said inner surface of said plurality of hollow tubes being in thermal communication with a heat load,

said heat sink array being separated from said inlet face by a distance, and

said heat sink array being positioned between said turbine outlet and said inlet face such that at least a portion of a fluid flowing from said turbine outlet contacts said heat sink array before said portion of said fluid contacts said inlet face,

wherein said fluid has a uniform temperature distribution across an outlet of said heat exchanger.

20. The fluid flow diverter of claim 19, wherein said heat load has a temperature greater than the freezing point of water.

21. The fluid flow diverter of claim 20, wherein said outer surface of said hollow tube has a temperature greater than the freezing point of water while said outer surface is in contact with said portion of said fluid flowing from said turbine outlet.

22. The flow diverter of claim 21, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by a cross section comprising a plurality of straight sides, a plurality of curved sides, or a combination thereof.

23. The flow diverter of claim 22, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by an essentially triangular shaped cross section.

24. The flow diverter of claim 22, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by an oval shaped cross section.

25. The flow diverter of claim 22, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by an essentially diamond shaped cross section.

26. The flow diverter of claim 22, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by an essentially tear-drop shaped aerodynamic cross section.

27. The flow diverter of claim 22, wherein said outer surface of at least one of said plurality of hollow tubes is characterized by an essentially circular cross section.

28. A fluid flow diverter comprising:

a heat sink array in fluid communication with a turbine outlet and an inlet face of a heat exchanger,

said heat sink array being separated from said inlet face by a first distance,

said heat sink array being positioned between said turbine outlet and said inlet face such that at least a portion of a fluid flowing from said turbine outlet contacts said heat sink array before said portion of said fluid contacts said inlet face,

said heat sink array comprising a plurality of hollow tubes,

said plurality of hollow tubes being angularly arranged to said fluid flowing from said turbine outlet,

said plurality of hollow tubes having an outer surface separated from an inner surface by a wall thickness, and

said inner surface being in fluid communication with a heat exchange medium, wherein said outer surface of at least one of said hollow tubes is located a second distance of about 5% to about 50% of a third distance between said turbine outlet and said inlet face.

29. The fluid flow diverter of claim 28, wherein said fluid has a uniform temperature distribution across an outlet of said heat exchanger.

30. The fluid flow diverter of claim 29, wherein said fluid prior to said heat sink array has a velocity greater than or equal to about 500 ft/sec, and a temperature less than or equal to the freezing point of water.

31. The fluid flow diverter of claim 30, wherein said fluid in contact with said inlet face has a velocity of less than or equal to about 50 ft/sec.

32. A fluid flow diverter comprising:

an expansion chamber having a turbine outlet at a first end and a heat exchanger inlet face at a second end located opposite to, and in fluid communication with, said first end,

a heat sink array comprising a plurality of heat sink elements disposed within said expansion chamber between, and in fluid communication with, said first end and said second end,

wherein a portion of a fluid entering said first end contacts said heat sink array prior to said fluid contacting said second end, and

wherein said heat sink array is positioned a distance from said second end.

33. The flow diverter of claim 32, wherein said heat sink array comprises a plurality of hollow tubes, each having an outer surface contactable with said fluid, each having an outer surface separated from an inner surface by a wall thickness, and each of said inner surfaces being in fluid communication with a heat exchange medium having a temperature greater than the freezing point of water.

34. The flow diverter of claim 33, wherein said plurality of hollow tubes are each arranged essentially perpendicular to said fluid flowing from said first end.

35. The flow diverter of claim 34, wherein said plurality of hollow tubes are each arranged essentially parallel to each other.

36. The fluid flow diverter of claim 35, wherein said plurality of hollow tubes are arranged in at least one plane disposed essentially perpendicular to said fluid flowing from said first end.

37. The fluid flow diverter of claim 36, wherein said plurality of hollow tubes are arranged in a plurality of parallel planes, each of said parallel planes disposed essentially perpendicular to said fluid flowing from said first end.

38. The fluid flow diverter of claim 37, wherein said plurality of hollow tubes are arranged in a staggered configuration.

39. The fluid flow diverter of claim 32, wherein a first distance between said first end and an outer surface of at least one of said heat sink elements is about 1% of a second distance between said first end and said second end.

40. The fluid flow diverter of claim 39, wherein said first distance is about 99% of said second distance.

41. The fluid flow diverter of claim 32, wherein at least one of said heat sink elements comprises an electric heater.

42. The fluid flow diverter of claim 32, wherein a first velocity of said fluid prior to said heat sink array is greater than or equal to about 5 times a second velocity of said fluid in contact with said second end.

43. The fluid flow diverter of claim 32, wherein said fluid prior to said heat sink array has a velocity greater than or equal to about 250 ft/sec, and a temperature less than or equal to the freezing point of water.

44. The fluid flow diverter of claim 43, wherein said fluid in contact with said second end has a velocity of less than or equal to about 50 ft/sec.

45. A cooling air system, comprising:

a heat exchanger;

a turbine having a turbine outlet in fluid communication with an inlet face of said heat exchanger,

said inlet face being in thermal and fluid contact with an outlet face of said heat exchanger,

said inlet face being disposed between said turbine outlet and said outlet face of said heat exchanger,

a heat sink array positioned between said turbine outlet and said inlet face such that at least a portion of a fluid flowing from said turbine outlet contacts said heat sink array before said fluid contacts said inlet face,

said heat sink array being separated from said inlet face by a distance,

said heat sink array comprising a plurality of hollow tubes,

said plurality of hollow tubes having an outer surface separated from an inner surface by a wall thickness,

said inner surface being in fluid communication with a heat exchange medium,

said plurality of hollow tubes arranged to said fluid flowing from said turbine outlet to provide a uniform temperature and air and entrained humidity distribution of said fluid across said inlet face.

46. A method of distributing a fluid to a heat exchanger, comprising:

expanding said fluid through a turbine having a turbine outlet in fluid communication with an inlet face of said heat exchanger,

diffusing said fluid through said turbine outlet;

contacting a portion of said fluid with a flow diverter arranged between said turbine outlet and said inlet face,

said flow diverter comprising a heat sink array comprising a plurality of heat sink elements,

said heat sink array being separated from said inlet face by a distance, and

said heat sink array being positioned between said turbine outlet and said inlet face such that at least a portion of a fluid flowing from said turbine outlet contacts said heat sink array before said portion of said fluid contacts said inlet face.

47. The method of claim 46, wherein said inlet face is in fluid communication with an outlet face, and wherein said fluid has a uniform temperature distribution across said outlet face.

48. The method of claim 46, wherein said heat sink array comprises a plurality of hollow tubes, each having an outer surface immersed in said fluid, each having an outer surface separated from an inner surface by a wall thickness, and each of said inner surfaces being in fluid communication with a heat exchange medium having a temperature greater than the freezing point of water.

49. The method of claim 46, wherein a first distance between said turbine outlet and an outer surface of at least one of said heat sink elements is about 1% of a second distance between said turbine outlet and said inlet face.

50. The method of claim 49, wherein said first distance is about 99% of said second distance.